

CLAIMS

1. An isolated nucleic acid fragment comprising a nucleic acid sequence encoding a fatty acid desaturase or a fatty acid desaturase-related enzyme with an amino acid identity of 50% or greater to the polypeptide encoded by SEQ ID NOS:1, 3, 5, 7, 9, 11, or 15.

5 2. The isolated nucleic acid fragment of Claim 1 wherein the amino acid identity is 60% or greater to the polypeptide encoded by SEQ ID NOS:1, 3, 5, 7, 9, 11, or 15.

10 3. The isolated nucleic acid fragment of Claim 1 wherein the nucleic acid identity is 90% or greater to SEQ ID NOS:1, 3, 5, 7, 9, 11, or 15.

4. The isolated nucleic acid fragment of Claim 1
15 wherein said fragment is isolated from an oil-producing plant species.

5. An isolated nucleic acid fragment comprising a nucleic acid sequence encoding a delta-12 fatty acid hydroxylase.

20 6. A chimeric gene capable of causing altered levels of ricinoleic acid in a transformed plant cell, said chimeric gene comprising a nucleic acid fragment of Claim 5, said fragment operably linked to suitable regulatory sequences.

25 7. A chimeric gene capable of causing altered levels of fatty acids in a transformed plant cell, said chimeric gene comprising a nucleic acid fragment of any of Claims 1, 2, 3, said fragment operably linked to suitable regulatory sequences.

30 8. Plants containing a chimeric gene of Claim 6 or Claim 7.

9. Oil obtained from seeds of the plants of Claim 8.

35 10. A method of producing seed oil containing altered levels of unsaturated fatty acids comprising:

(a) transforming a plant cell of an oil-producing species with a chimeric gene of Claim 5;

(b) growing fertile plants from the transformed plant cells of step (a);

5 (c) screening progeny seeds from the fertile plants of step (b) for the desired levels of unsaturated fatty acids; and

(d) processing the progeny seed of step (c) to obtain seed oil containing altered levels of

10 unsaturated fatty acids.

11. A method of molecular breeding to obtain altered levels of a fatty acid in seed oil of oil-producing plant species comprising:

15 (a) making a cross between two varieites of oil-producing species differing in the fatty acid trait;

(b) making a Southern blot of restriction enzyme digested genomic DNA isolated from several progeny plants resulting from the cross of step (a); and

(c) hybridizing the Southern blot with the

20 radiolabelled nucleic acid fragment of Claim 1.

12. A method of RFLP mapping comprising:

(a) making a cross between two varieties of plants;

(b) making a Southern blot of restriction

25 enzyme digested genomic DNA isolated from several progeny plants resulting from the cross of step (a); and

(c) hybridizing the Southern blot with the radiclabelled nucleic acid fragments of Claim 1.

13. A method to isolate nucleic acid fragments encoding fatty acid desaturases and related enzymes, comprising:

(a) comparing SEQ ID NOS:2, 4, 6, 8, 10, or 12 and other fatty acid desaturase polypeptide sequences;

(b) identifying the conserved sequences of 4 or more amino acids obtained in step a;

(c) designing degenerate oligomers based on the conserved sequences identified in step b; and

5 (d) using the degenerate oligomers of step c to isolate sequences encoding fatty acid desaturases and desaturase-related enzymes by sequence dependent protocols.

14. An isolated nucleic acid fragment of Claim 1 comprising a nucleic acid sequence encoding a plant microsomal delta-12 fatty acid desaturase.

15. A method for altering fatty acids composition in seeds comprising:

15 (a) making a cross between a mutant line with altered fatty acid composition with a plant containing the chimeric gene of Claim 7;

(b) growing fertile plants from seeds obtained from the cross; and

20 (c) screening progeny seeds from the fertile plants of step (b) for seeds containing altered fatty acid levels.

16. A method for reducing polyunsaturated fatty acids in rapeseed oil comprising:

25 (a) making a cross between a rapeseed variety with increased oleic acid content or reduced linolenic acid content with a plant containing the chimeric gene of Claim 7;

(b) growing fertile plants from seeds obtained from the cross; and

30 (c) screening progeny seeds from the fertile plants of step (b) for seeds containing reduced polyunsaturated fatty acids.

17. The method of Claim 16 wherein the cross in (a) is between a progeny plant derived from a seed comprising the Brassica variety having an oleic acid

content of about 69% to 77%, based upon total extractable oil and belonging to a line in which the said oleic acid content has been stabilized for both the generation to which the seed belongs and its parent 5 generation.

18. A method for reducing saturated fatty acids in rapeseed seeds comprising:

(a) making a cross between a rapeseed variety with increased oleic acid content with a plant 10 containing the chimeric gene of Claim 7;

(b) growing fertile plants from seeds obtained from the cross; and

(c) screening progeny seeds from the fertile plants of step (b) for seeds containing reduced 15 saturated fatty acids.

19. A method for reducing polyunsaturated fatty acids in soybean oil comprising:

(a) making a cross between a soybean variety with increased oleic acid content or reduced linolenic 20 acid content with a plant containing the chimeric gene of Claim 7;

(b) growing fertile plants from seeds obtained from the cross; and

(c) screening progeny seeds from the fertile 25 plants of step (b) for seeds containing reduced polyunsaturated fatty acids.

20. A method for reducing saturated fatty acids in soybean seeds comprising:

(a) making a cross between a soybean variety 30 with increased oleic acid content with a plant containing the chimeric gene of Claim 7;

(b) growing fertile plants from seeds obtained from the cross; and

(c) screening progeny seeds from the fertile plants of step (b) for seeds containing reduced saturated fatty acids.

21. A *Brassica* sp. plant with seed palmitic acid of 2.7% or lower of total fatty acid.

22. A *Brassica* sp. plant with seed stearic acid of 1.1% or lower of total fatty acid.

23. A *Brassica* sp. plant with a combined seed palmitic acid and stearic acid content of 3.9% or lower of total fatty acids.

24. A soybean plant with seed palmitic acid of 6.7% or lower of total fatty acid.

25. A soybean plant with seed stearic acid of 2.1% or lower of total fatty acid.

26. A soybean plant with a combined seed palmitic acid and stearic acid content of 9.2% or lower total of fatty acids.

27. Oil obtained from the plants of Claims 21-26.